

CLAIMS:

- 1 1. A method of forming a stacked device filler, comprising:  
2 forming a first layer of material between two or more substrates of a stacked  
3 device;  
4 forming a second layer of material between the two or more substrates of the  
5 stacked device, wherein the second material causes a reaction in at least a portion of the  
6 first layer of material.
- 1 2. The method of claim 1, wherein the reaction comprises polymerization.
- 1 3. The method of claim 1, wherein said forming a first layer comprises diffusing a  
2 first material between at least a portion of the two or more substrates of the stacked  
3 device.
- 1 4. The method of claim 3, wherein the material comprises one or more of:  
2 diisocyanate monomers, a diisocyanate end-capped compliant oligomer, and p-  
3 toluenesulfonyl semicarbazide.
- 1 5. The method of claim 1, wherein said forming a first layer comprises one or more  
2 of: injection, spraying, and immersion.
- 1 6. The method of claim 1, wherein forming said second layer diffusing a second  
2 material between at least a portion of the two or more substrates of the stacked device.

1 7. The method of claim 3, wherein the material comprises one or more of: water, an  
2 hydroxyl end-capped oligomer, and a carboxylic acid end-capped polymer.

1 8. The method of claim 1, wherein said forming a second layer comprises one or  
2 more of: injection, spraying, and immersion.

1 9. The method of claim 1, wherein the reaction results in the production of a  
2 polymer foam.

1 10. A method of forming a stacked semiconductor device, comprising:  
2 forming one or more layers of material on at least a portion of the top surface of a  
3 substrate, said substrate having one or more interconnect structures formed thereon, said  
4 interconnect structures each having a top surface;  
5 selectively removing at least a portion of the one or more layers of material;  
6 assembling the substrate into a stacked semiconductor device; and  
7 causing a reaction in at least a portion of the one or more layers of material.

1 11. The method of claim 10, wherein the reaction comprises polymerization.

1 12. The method of claim 10, wherein said forming comprises spin coating.

1 13. The method of claim 12, wherein said material layer is spin coated to a thickness  
2 greater than the top surface of the one or more interconnect structures.

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1 14. The method of claim 10, wherein the selective removing comprises one or more  
2 of: chemical etch, dry etch, and mechanical etch.

1 15. The method of claim 10, wherein said material layer is selectively removed such  
2 that the material is removed from the top surface of one or more interconnect structures.

1 16. The method of claim 10, wherein said one or more layers are formed from one or  
2 more of: water, hydroxyl end-capped oligomers, and carboxylic acid end-capped  
3 polymers.

1 17. The method of claim 10, wherein the reaction results in the production of a  
2 polymer foam.

1 18. A stacked microelectronic device, comprising:  
2 a first substrate of silicon, said substrate having a top surface;  
3 a plurality of interconnect structures formed on at least a portion of the substrate;  
4 a layer of material formed on at least a portion of the top surface of the substrate  
5 of silicon;  
6 a second substrate of silicon with a plurality of interconnect structures formed  
7 thereon, said first and second substrate interconnect structures configured such that at  
8 least a portion of the interconnect structures of said first and second substrate respectively  
9 are in physical contact.

1 19. The apparatus of claim 18, wherein the layer of material substantially comprises a  
2 polymer foam.

1 20. The apparatus of claim 19, wherein the polymer foam comprises one or more of:  
2 polystyrene, polyester, and polyurethane.

1 21. The apparatus of claim 18, wherein the layer of material substantially comprises  
2 one or more of: diisocyanate monomers, a diisocyanate end-capped compliant oligomer,  
3 and p-toluenesulfonyl semicarbazide

1 22. The apparatus of claim 18, wherein the layer of material substantially comprises  
2 one of: water, a hydroxyl end-capped oligomer, and a carboxylic acid end-capped  
3 polymer.

1 23. The apparatus of claim 18, wherein the apparatus comprises a stacked chipset.

1 24. The apparatus of claim 18, wherein the first and second substrates comprise  
2 integrated circuits.

1 25. The apparatus of claim 18, wherein at least a portion of the interconnect structures  
2 comprise copper vias.

1 26. A method of forming a stacked device filler, comprising:  
2 forming a layer of material between two or more substrates of a stacked device;  
3 and

4 causing a reaction in at least a portion of the layer of material, wherein the  
5 reaction results in at least a portion of the layer of material increasing in size.

1 27. The method of claim 26, wherein the reaction comprises polymerization.

1 28. The method of claim 26, wherein forming the material layer comprises one or  
2 more of: immersion, injection, and spraying.

1 29. The method of claim 26, wherein the reaction results in the formation of a  
2 polymer foam.